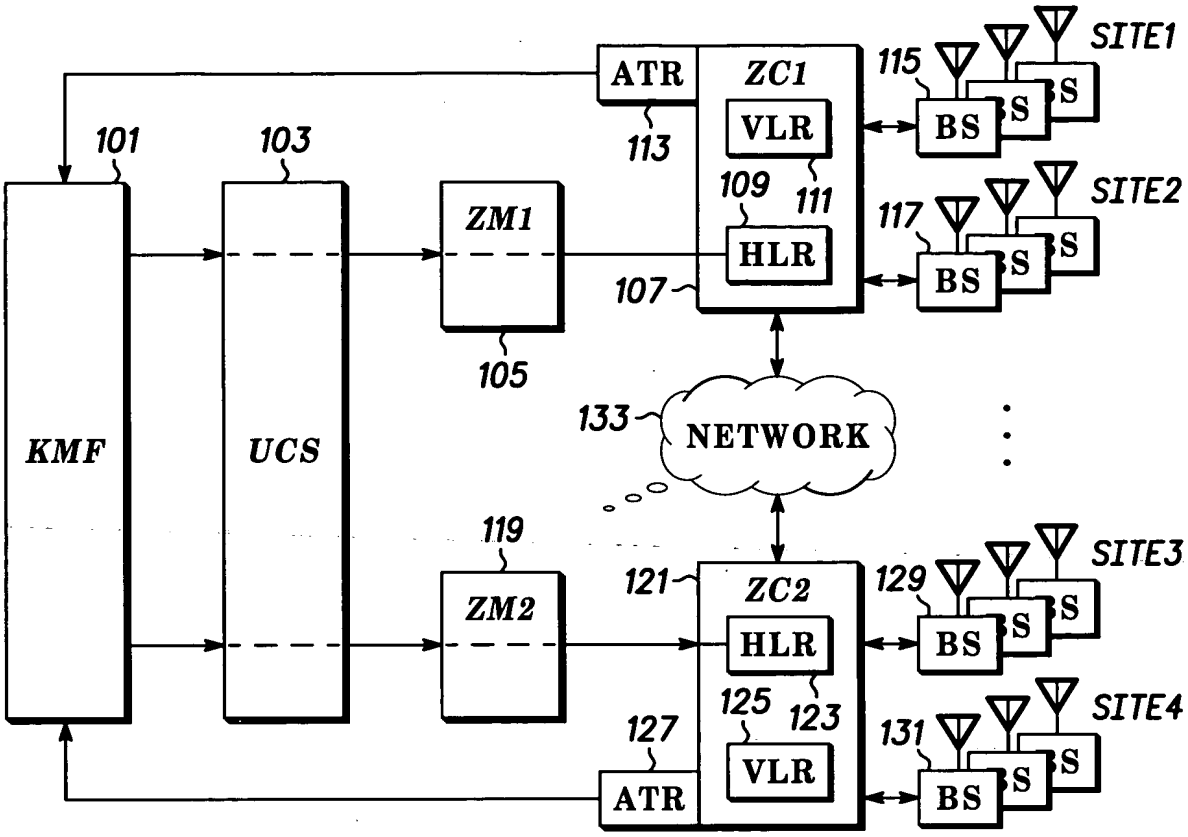
KMF
UCS
101
103
ZM1
ZM2
105
119
ATR
ZC1
VLR
HLR
113
109
111
107
ATR
ZC2
VLR
HLR
127
125
123
121
NETWORK
133
BS
115
117
129
131
SITE1
SITE2
SITE3
SITE4

FIG. 1

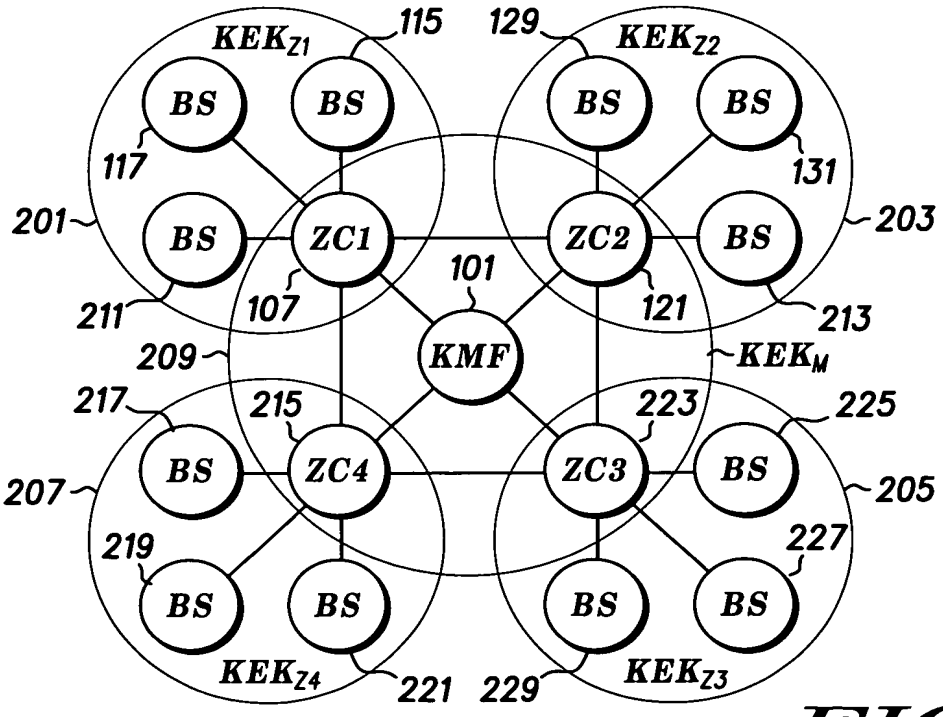
KEKZ1
KEKZ2
KEKZ3
KEKZ4
KEKM
BS
ZC1
ZC2
ZC3
ZC4
KMF
115
129
117
131
201
203
211
213
107
121
101
209
217
215
223
225
207
205
219
227
221
229

FIG. 2

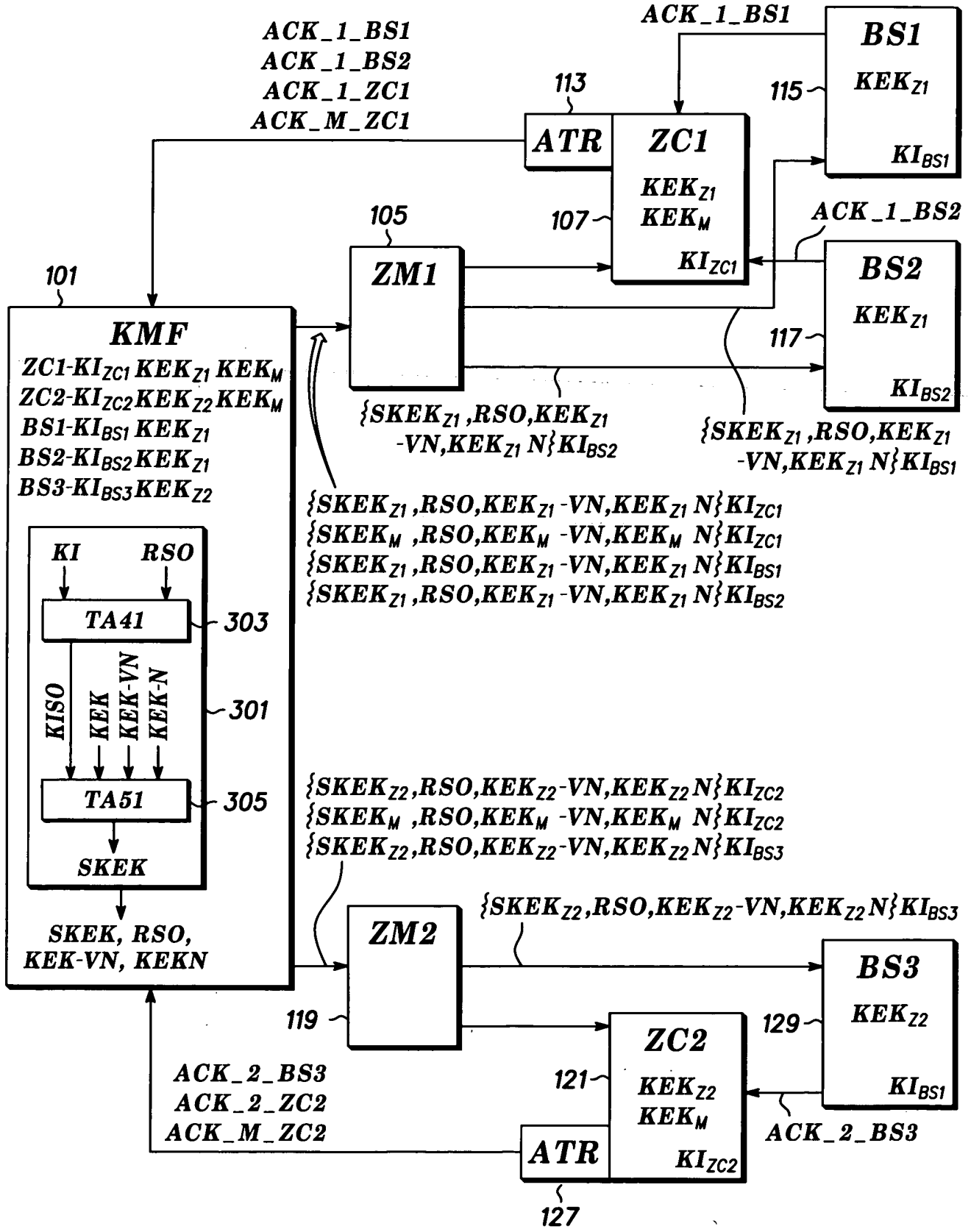
ACK_1_BS1
ACK_1_BS2
ACK_1_ZC1
ACK_M_ZC1
ACK_1_BS1
BS1
KEK_Z1
KI_BS1
115
113
ATR
ZC1
KEK_Z1
KEK_M
KI_ZC1
107
105
ZM1
ACK_1_BS2
BS2
KEK_Z1
KI_BS2
117
101
KMF
ZC1-KI_ZC1 KEK_Z1 KEK_M
ZC2-KI_ZC2 KEK_Z2 KEK_M
BS1-KI_BS1 KEK_Z1
BS2-KI_BS2 KEK_Z1
BS3-KI_BS3 KEK_Z2
{SKEK_Z1 ,RSO,KEK_Z1 -VN,KEK_Z1 N}KI_BS2
{SKEK_Z1 ,RSO,KEK_Z1 -VN,KEK_Z1 N}KI_BS1
{SKEK_Z1 ,RSO,KEK_Z1 -VN,KEK_Z1 N}KI_ZC1
{SKEK_M ,RSO,KEK_M -VN,KEK_M N}KI_ZC1
{SKEK_Z1 ,RSO,KEK_Z1 -VN,KEK_Z1 N}KI_BS1
{SKEK_Z1 ,RSO,KEK_Z1 -VN,KEK_Z1 N}KI_BS2
KI
RSO
TA41
303
KISO
KEK
KEK-VN
KEK-N
301
TA51
305
SKEK
SKEK, RSO,
KEK-VN, KEKN
{SKEK_Z2,RSO,KEK_Z2-VN,KEK_Z2N}KI_ZC2
{SKEK_M ,RSO,KEK_M -VN,KEK_M N}KI_ZC2
{SKEK_Z2,RSO,KEK_Z2-VN,KEK_Z2N}KI_BS3
{SKEK_Z2,RSO,KEK_Z2-VN,KEK_Z2N}KI_BS3
ZM2
119
BS3
KEK_Z2
KI_BS1
129
ZC2
121
KEK_Z2
KEK_M
KI_ZC2
ATR
127
ACK_2_BS3
ACK_2_ZC2
ACK_M_ZC2
ACK_2_BS3

FIG. 3

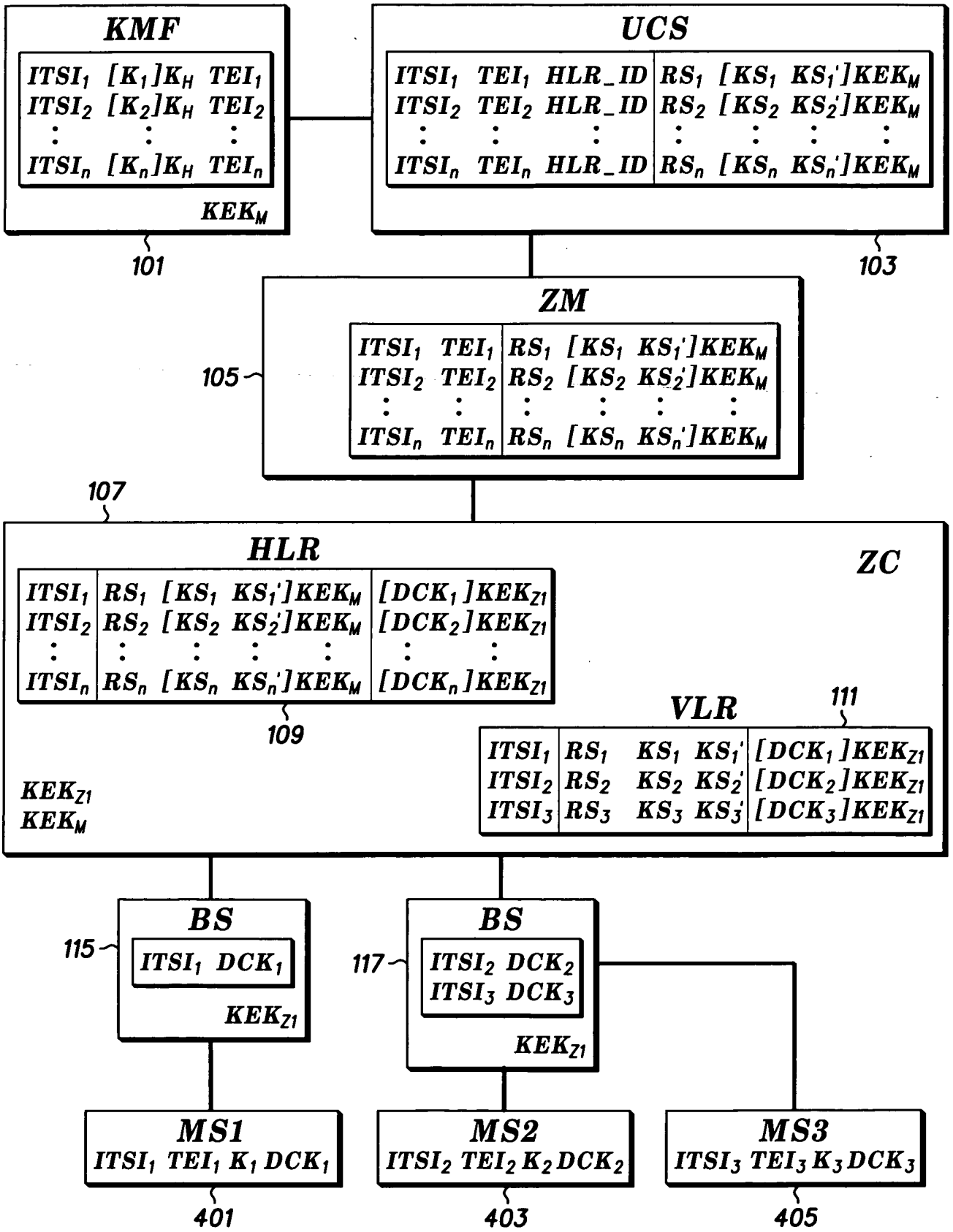
KMF
ITSI1 [K1]KH TEI1
ITSI2 [K2]KH TEI2
ITSIn [Kn]KH TEIn
KEKM
101
UCS
ITSI1 TEI1 HLR_ID | RS1 [KS1 KS1']KEKM
ITSI2 TEI2 HLR_ID | RS2 [KS2 KS2']KEKM
ITSIn TEIn HLR_ID | RSn [KSn KSn']KEKM
103
ZM
105
ITSI1 TEI1 | RS1 [KS1 KS1']KEKM
ITSI2 TEI2 | RS2 [KS2 KS2']KEKM
ITSIn TEIn | RSn [KSn KSn']KEKM
107
HLR
ITSI1 | RS1 [KS1 KS1']KEKM | [DCK1]KEKZ1
ITSI2 | RS2 [KS2 KS2']KEKM | [DCK2]KEKZ1
ITSIn | RSn [KSn KSn']KEKM | [DCKn]KEKZ1
109
ZC
VLR
111
ITSI1 | RS1 KS1 KS1' | [DCK1]KEKZ1
ITSI2 | RS2 KS2 KS2' | [DCK2]KEKZ1
ITSI3 | RS3 KS3 KS3' | [DCK3]KEKZ1
KEKZ1
KEKM
BS
115
ITSI1 DCK1
KEKZ1
BS
117
ITSI2 DCK2
ITSI3 DCK3
KEKZ1
MS1
ITSI1 TEI1 K1 DCK1
401
MS2
ITSI2 TEI2 K2 DCK2
403
MS3
ITSI3 TEI3 K3 DCK3
405

FIG. 4

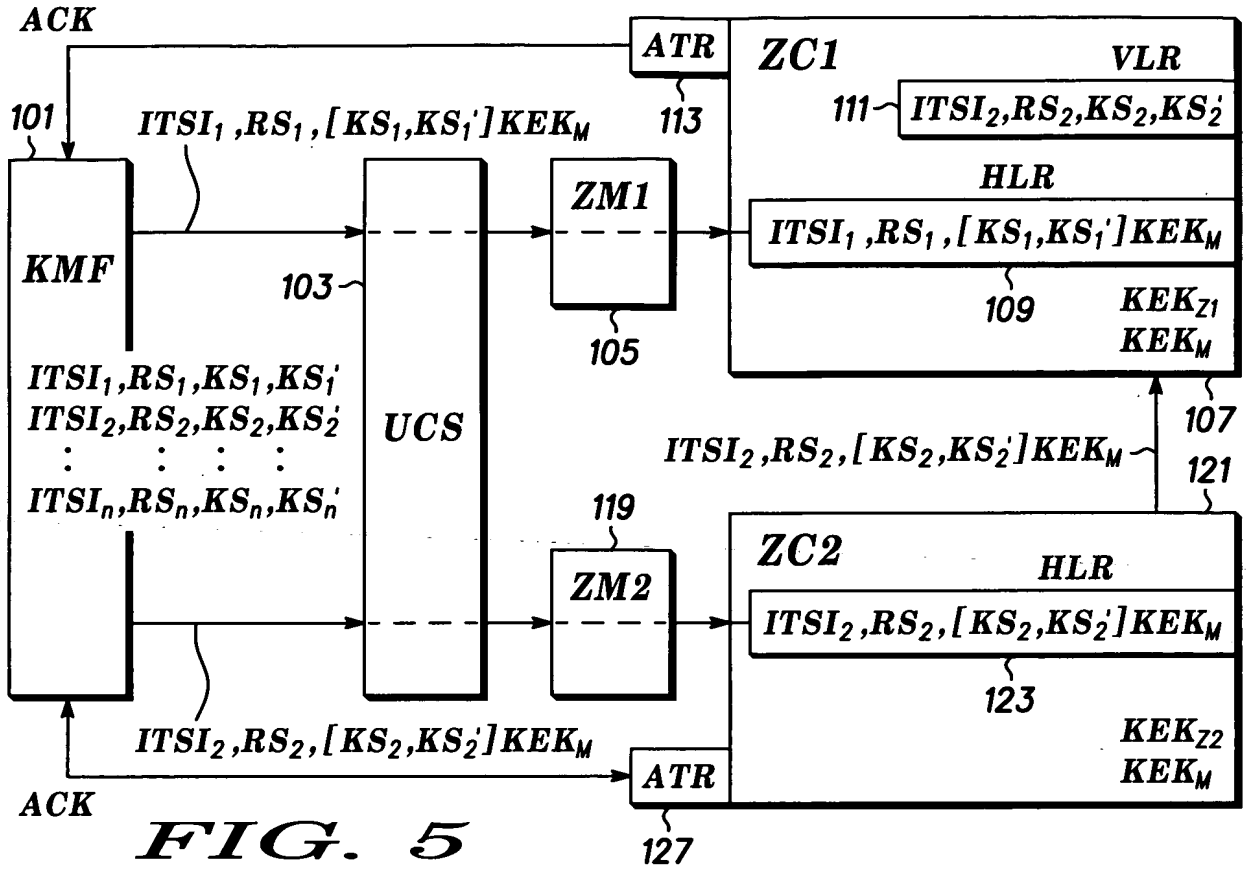
ACK
ATR
113
ZC1
VLR
111
ITSI2,RS2,KS2,KS2'
HLR
101
ITSI1,RS1,[KS1,KS1']KEKM
ZM1
KMF
103
UCS
105
ITSI1,RS1,KS1,KS1'
ITSI2,RS2,KS2,KS2'
ITSIn,RSn,KSn,KSn'
109
KEKZ1
KEKM
107
ITSI2,RS2,[KS2,KS2']KEKM
121
119
ZM2
ZC2
HLR
ITSI2,RS2,[KS2,KS2']KEKM
123
KEKZ2
KEKM
ITSI2,RS2,[KS2,KS2']KEKM
ACK
ATR
127

FIG. 5

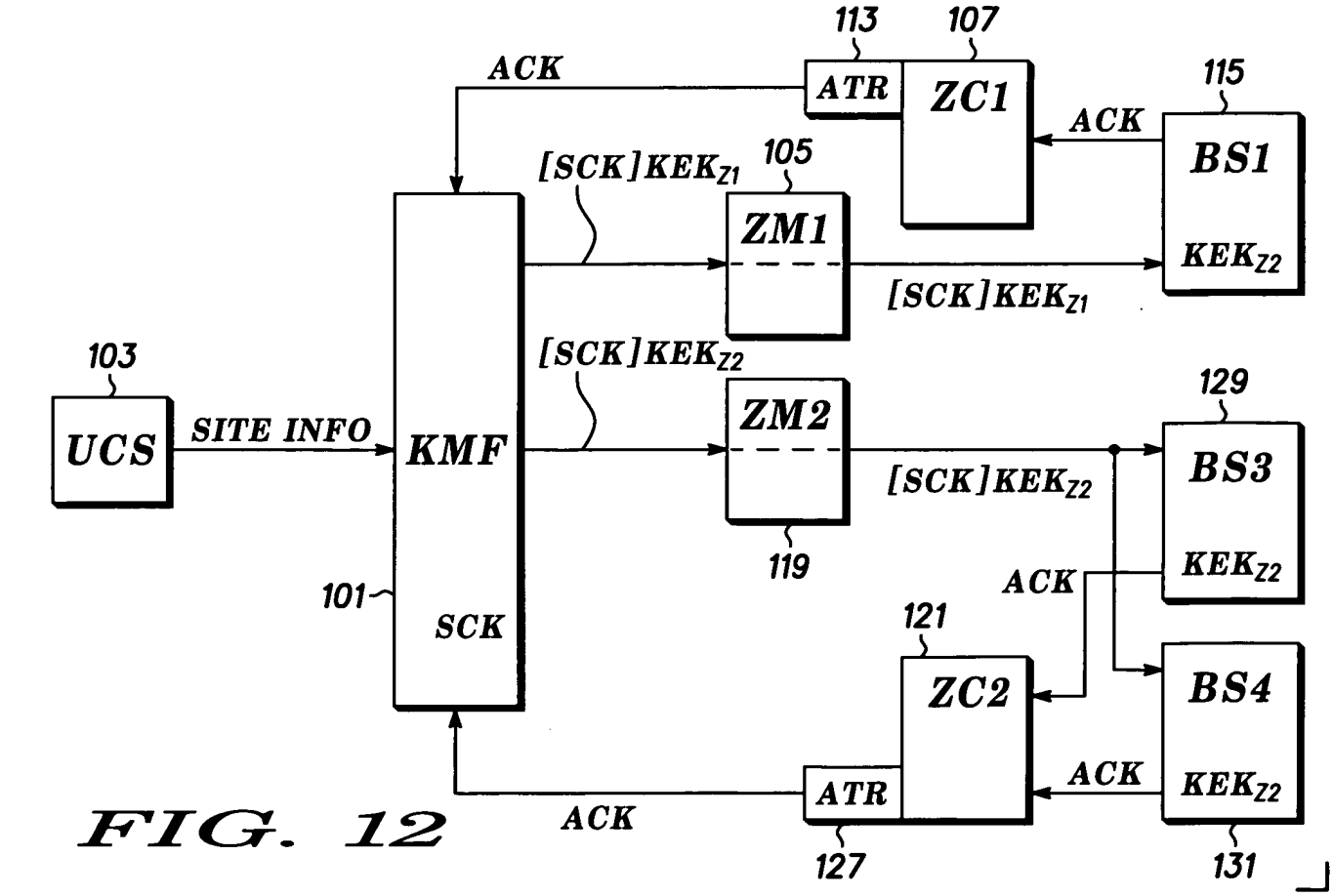
113
107
ACK
ATR
ZC1
115
ACK
BS1
[SCK]KEKZ1
105
ZM1
KEKZ2
[SCK]KEKZ1
103
[SCK]KEKZ2
129
UCS
SITE INFO
KMF
ZM2
BS3
[SCK]KEKZ2
KEKZ2
ACK
101
SCK
119
121
ZC2
BS4
ACK
ATR
ACK
KEKZ2
ACK
127
131

FIG. 12

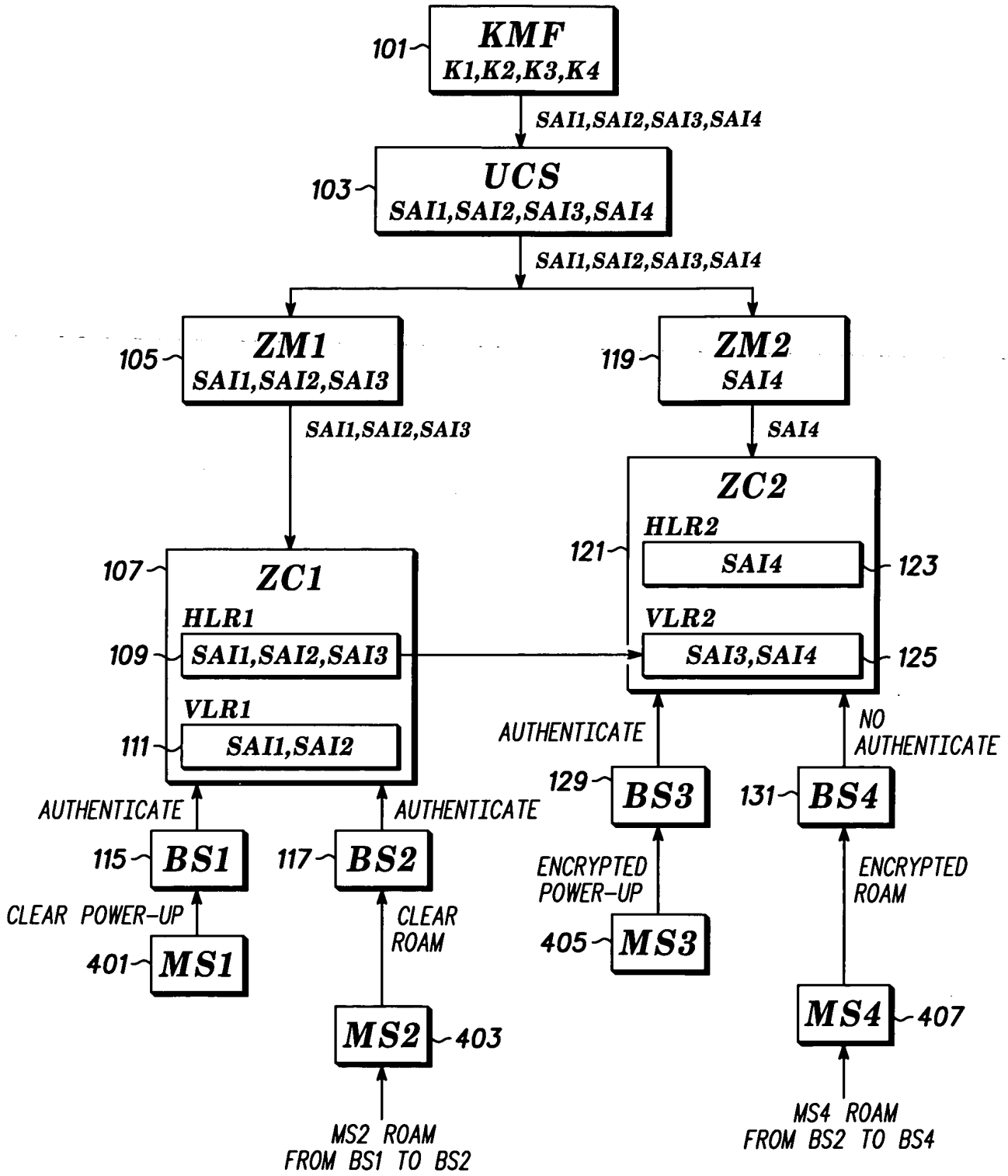
101
KMF
K1,K2,K3,K4
SAI1,SAI2,SAI3,SAI4
103
UCS
SAI1,SAI2,SAI3,SAI4
SAI1,SAI2,SAI3,SAI4
105
ZM1
SAI1,SAI2,SAI3
119
ZM2
SAI4
SAI1,SAI2,SAI3
SAI4
ZC2
HLR2
121
SAI4
123
VLR2
SAI3,SAI4
125
107
ZC1
HLR1
109
SAI1,SAI2,SAI3
VLR1
111
SAI1,SAI2
AUTHENTICATE
AUTHENTICATE
AUTHENTICATE
NO AUTHENTICATE
129
BS3
131
BS4
115
BS1
117
BS2
ENCRYPTED POWER-UP
ENCRYPTED ROAM
CLEAR POWER-UP
CLEAR ROAM
405
MS3
401
MS1
MS2
403
MS4
407
MS2 ROAM FROM BS1 TO BS2
MS4 ROAM FROM BS2 TO BS4

FIG. 6

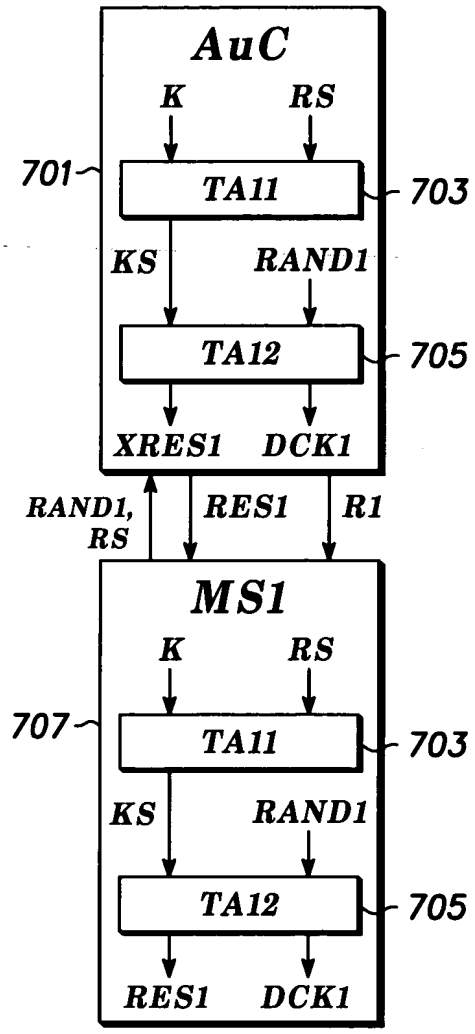
AuC
K
RS
701
TA11
703
KS
RAND1
TA12
705
XRES1
DCK1
RAND1,
RS
RES1
R1
MS1
K
RS
707
TA11
703
KS
RAND1
TA12
705
RES1
DCK1

FIG. 7

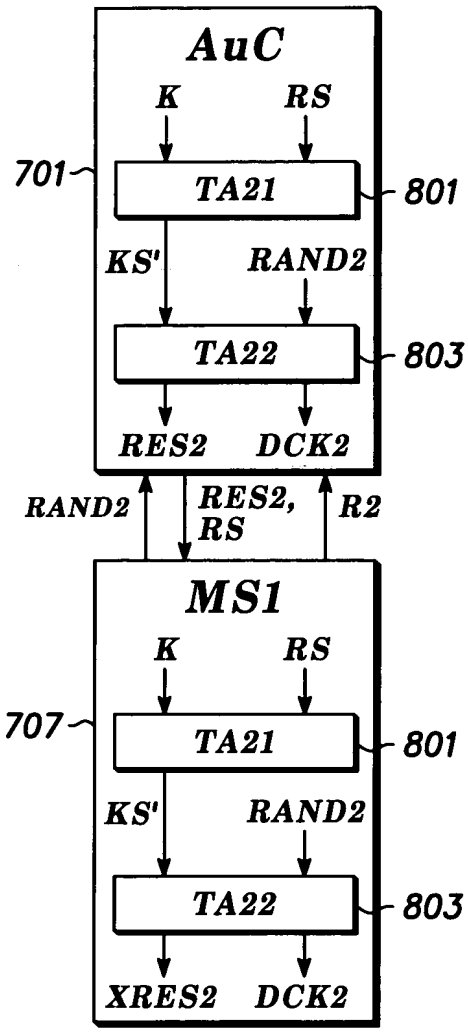
AuC
K
RS
701
TA21
801
KS'
RAND2
TA22
803
RES2
DCK2
RAND2
RES2,
RS
R2
MS1
K
RS
707
TA21
801
KS'
RAND2
TA22
803
XRES2
DCK2

FIG. 8

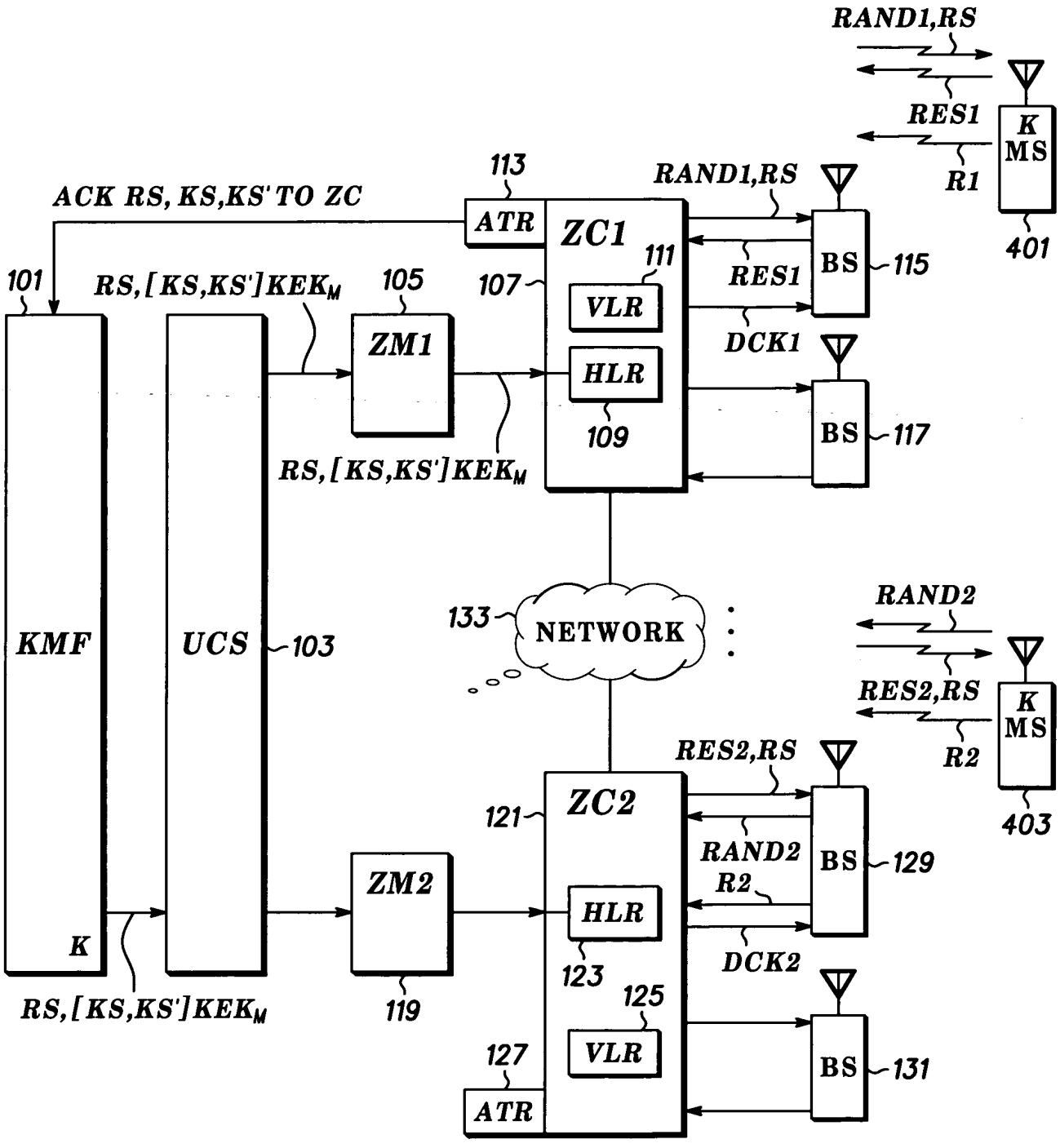
RAND1,RS
RES1
R1
K
MS
401
113
ATR
ZC1
111
VLR
HLR
109
107
ACK RS, KS,KS' TO ZC
101
RS,[KS,KS']KEK$_M$
105
ZM1
RAND1,RS
RES1
BS
115
DCK1
BS
117
RS,[KS,KS']KEK$_M$
KMF
K
UCS
103
133
NETWORK
RAND2
RES2,RS
R2
K
MS
403
RES2,RS
121
ZC2
RAND2
R2
BS
129
DCK2
ZM2
HLR
123
125
VLR
127
ATR
BS
131
RS,[KS,KS']KEK$_M$
119

FIG. 9

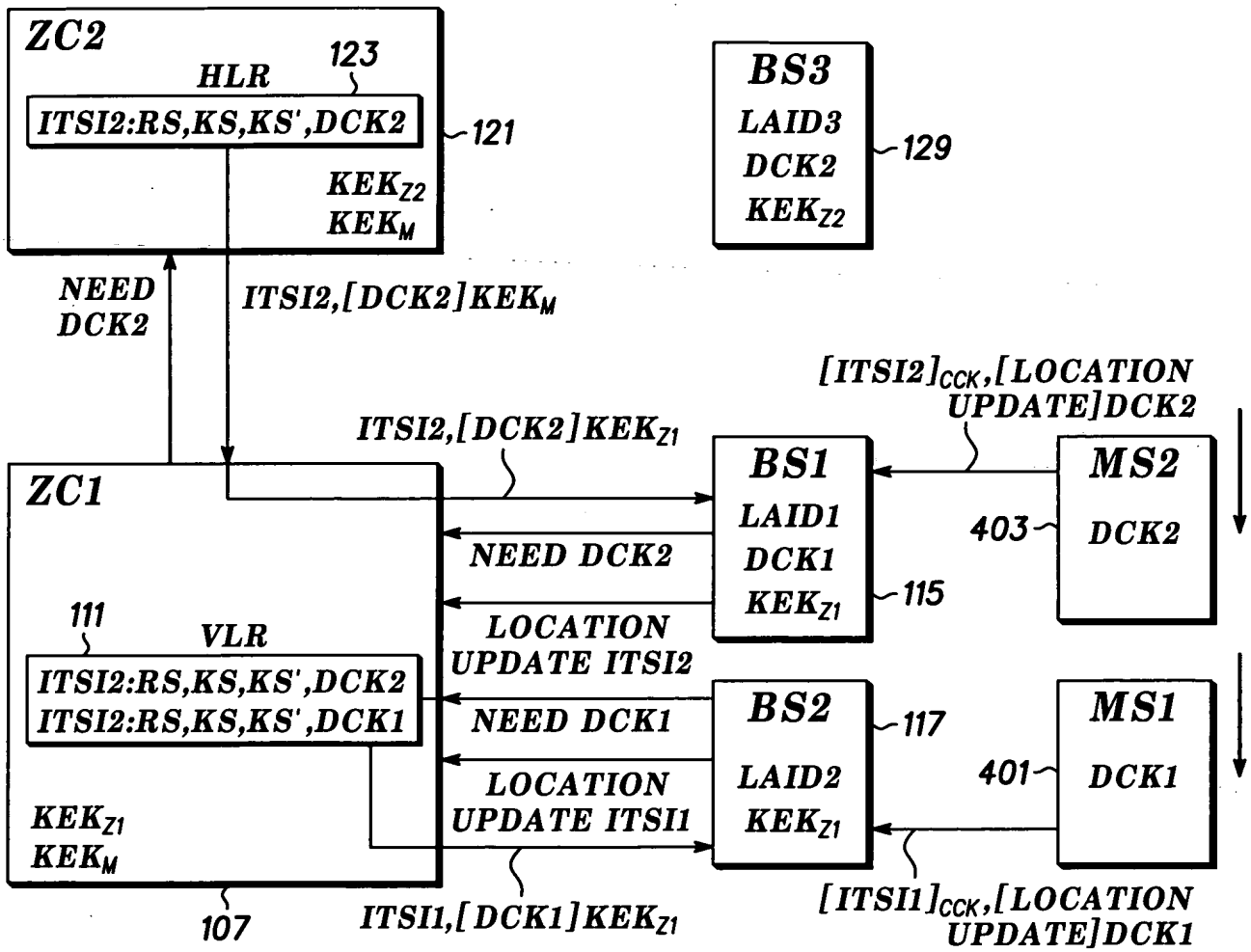
ZC2
HLR
123
ITSI2:RS,KS,KS',DCK2
121
KEKZ2
KEKM
BS3
LAID3
DCK2
KEKZ2
129
NEED DCK2
ITSI2,[DCK2]KEKM
[ITSI2]CCK,[LOCATION UPDATE]DCK2
ITSI2,[DCK2]KEKZ1
ZC1
BS1
LAID1
DCK1
KEKZ1
115
MS2
403
DCK2
NEED DCK2
LOCATION UPDATE ITSI2
111
VLR
ITSI2:RS,KS,KS',DCK2
ITSI2:RS,KS,KS',DCK1
BS2
117
LAID2
KEKZ1
NEED DCK1
LOCATION UPDATE ITSI1
MS1
401
DCK1
KEKZ1
KEKM
107
ITSI1,[DCK1]KEKZ1
[ITSI1]CCK,[LOCATION UPDATE]DCK1

FIG. 10

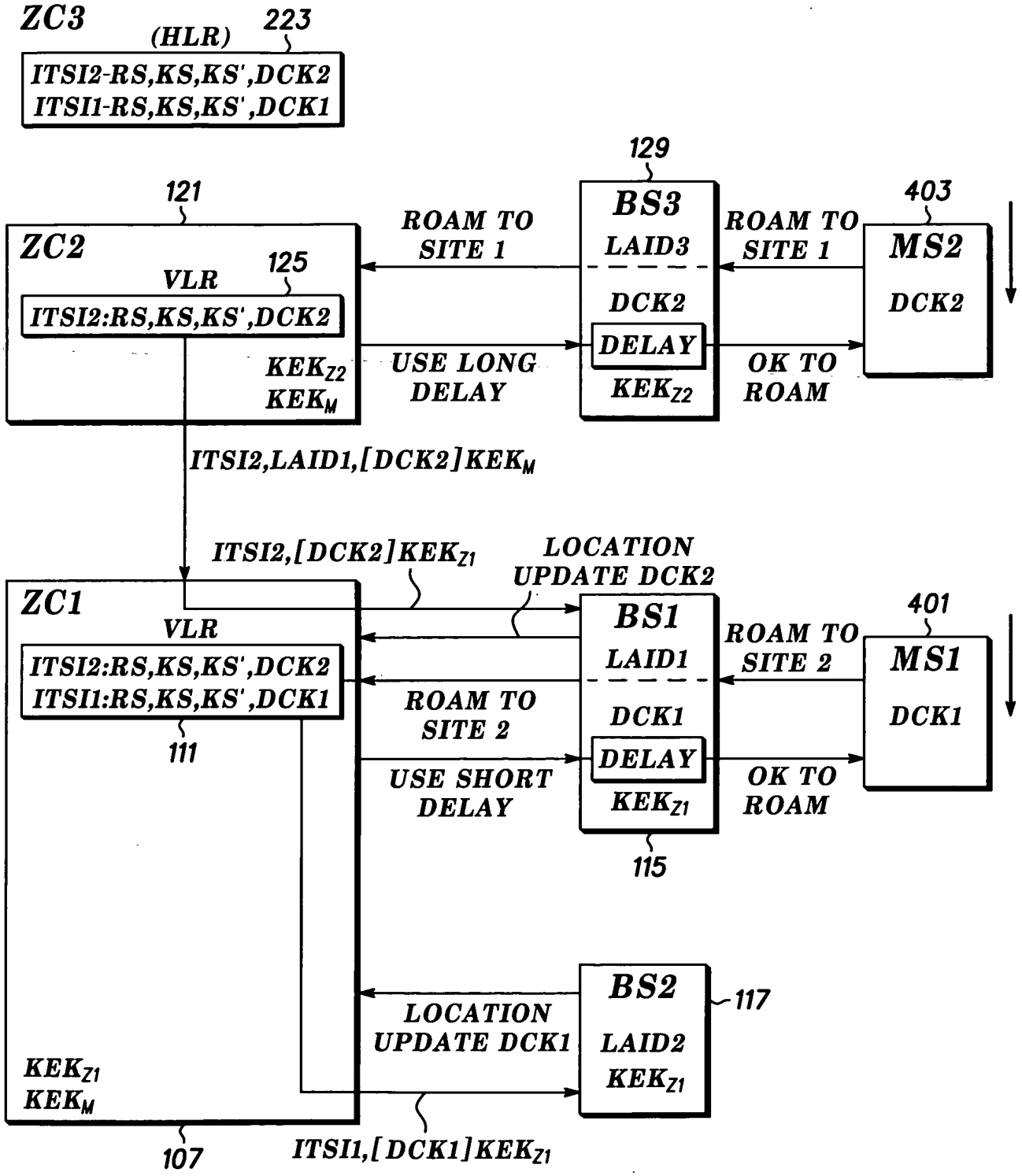
ZC3
(HLR)
223
ITSI2-RS,KS,KS',DCK2
ITSI1-RS,KS,KS',DCK1
129
121
BS3
LAID3
DCK2
DELAY
KEKZ2
403
MS2
DCK2
ROAM TO SITE 1
ROAM TO SITE 1
ZC2
VLR
125
ITSI2:RS,KS,KS',DCK2
KEKZ2
KEKM
USE LONG DELAY
OK TO ROAM
ITSI2,LAID1,[DCK2]KEKM
ITSI2,[DCK2]KEKZ1
LOCATION UPDATE DCK2
ZC1
VLR
ITSI2:RS,KS,KS',DCK2
ITSI1:RS,KS,KS',DCK1
111
BS1
LAID1
DCK1
DELAY
KEKZ1
401
MS1
DCK1
ROAM TO SITE 2
ROAM TO SITE 2
USE SHORT DELAY
OK TO ROAM
115
BS2
117
LOCATION UPDATE DCK1
LAID2
KEKZ1
KEKZ1
KEKM
107
ITSI1,[DCK1]KEKZ1

FIG. 11

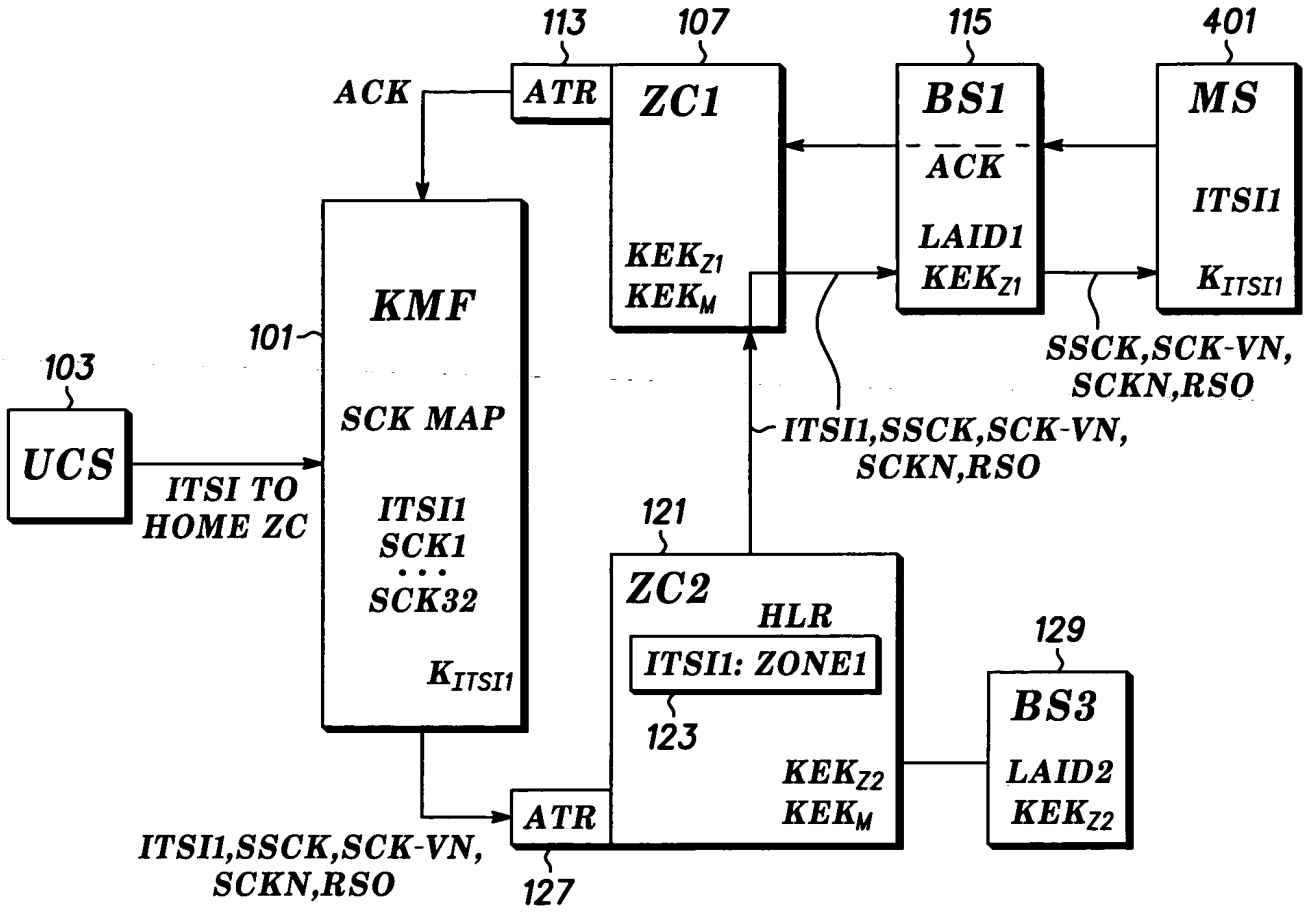
113
107
115
401
ACK
ATR
ZC1
BS1
MS
ACK
ITSI1
LAID1
KEKZ1
KEKM
KEKZ1
KITSI1
SSCK,SCK-VN,
SCKN,RSO
KMF
101
103
SCK MAP
ITSI1,SSCK,SCK-VN,
SCKN,RSO
UCS
ITSI TO
HOME ZC
ITSI1
SCK1
SCK32
KITSI1
121
ZC2
HLR
ITSI1: ZONE1
123
129
BS3
LAID2
KEKZ2
KEKZ2
KEKM
ATR
ITSI1,SSCK,SCK-VN,
SCKN,RSO
127

FIG. 13

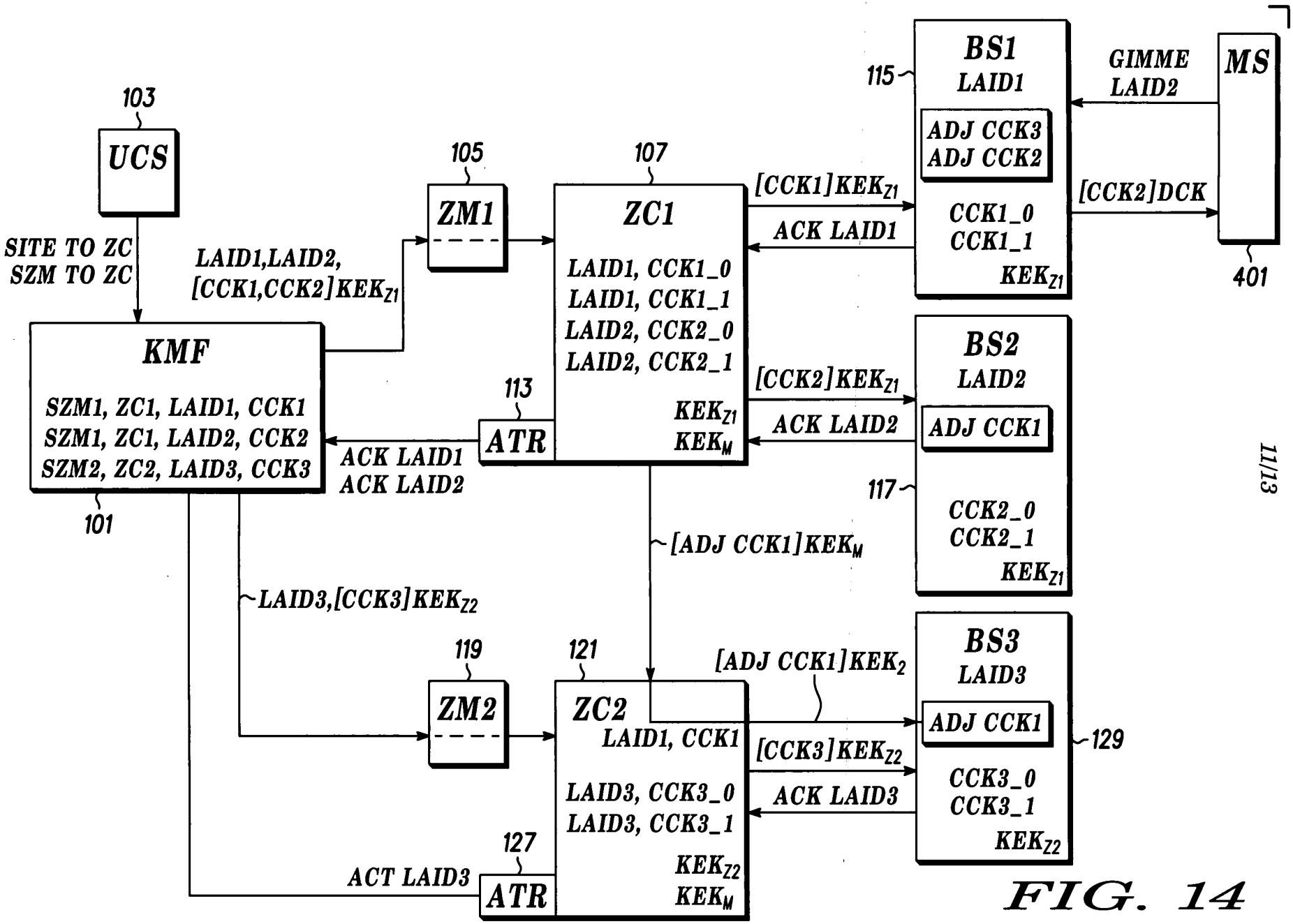

FIG. 14

SOWA
CM 04812 H

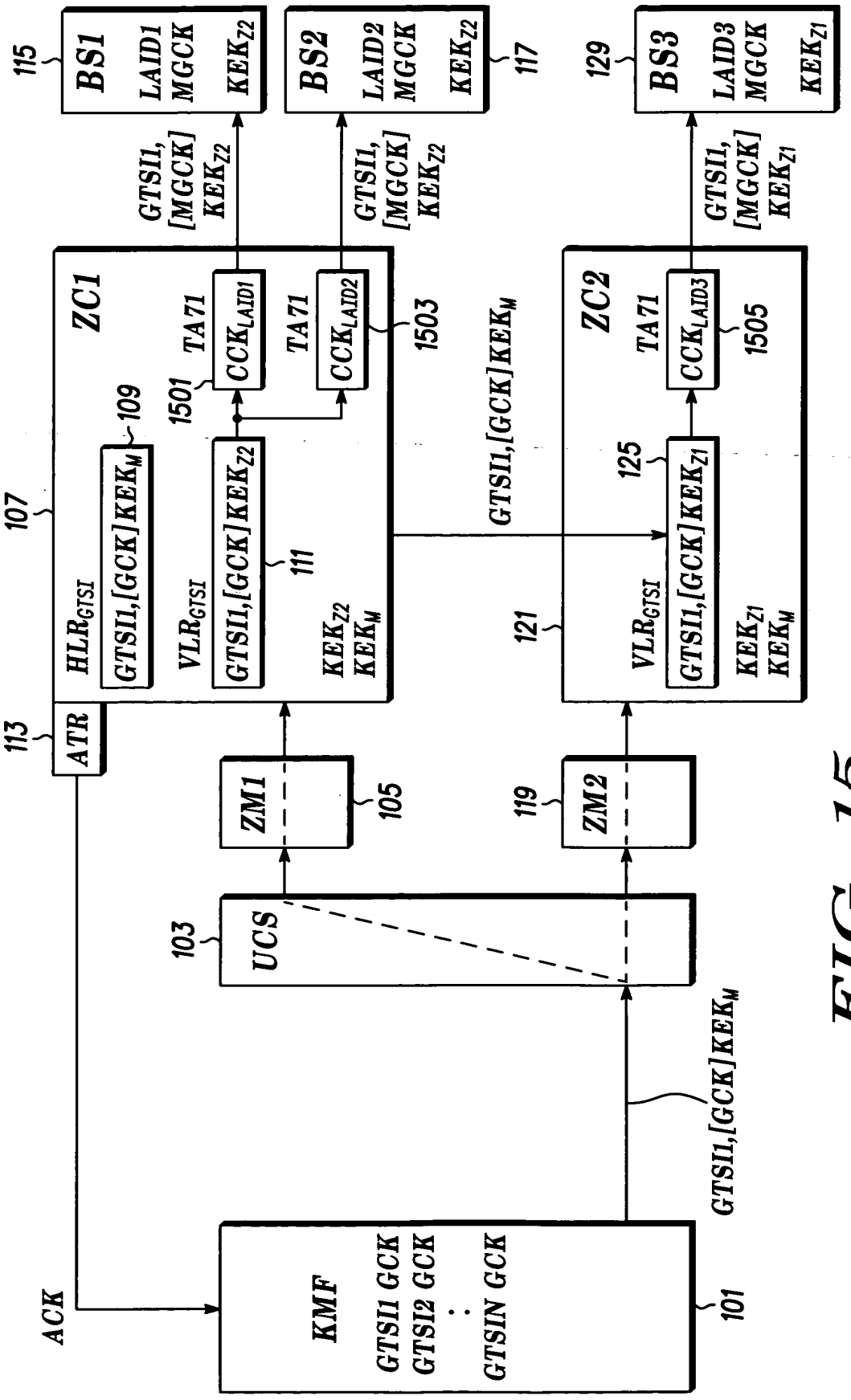
KMF
GTSI1 GCK
GTSI2 GCK
GTSIN GCK
101
ACK
GTSI1,[GCK]KEK_M
UCS
103
ZM1
105
ZM2
119
ATR
113
ZC1
107
HLR_GTSI
GTSI1,[GCK]KEK_M
109
VLR_GTSI
GTSI1,[GCK]KEK_Z2
111
KEK_Z2
KEK_M
TA 71
1501
CCK_LAID1
TA 71
CCK_LAID2
1503
GTSI1,[GCK]KEK_M
ZC2
121
VLR_GTSI
GTSI1,[GCK]KEK_Z1
125
KEK_Z1
KEK_M
TA 71
CCK_LAID3
1505
BS1
LAID1
MGCK
KEK_Z2
115
BS2
LAID2
MGCK
KEK_Z2
117
BS3
LAID3
MGCK
KEK_Z1
129
GTSI1, [MGCK] KEK_Z2
GTSI1, [MGCK] KEK_Z2
GTSI1, [MGCK] KEK_Z1

FIG. 15

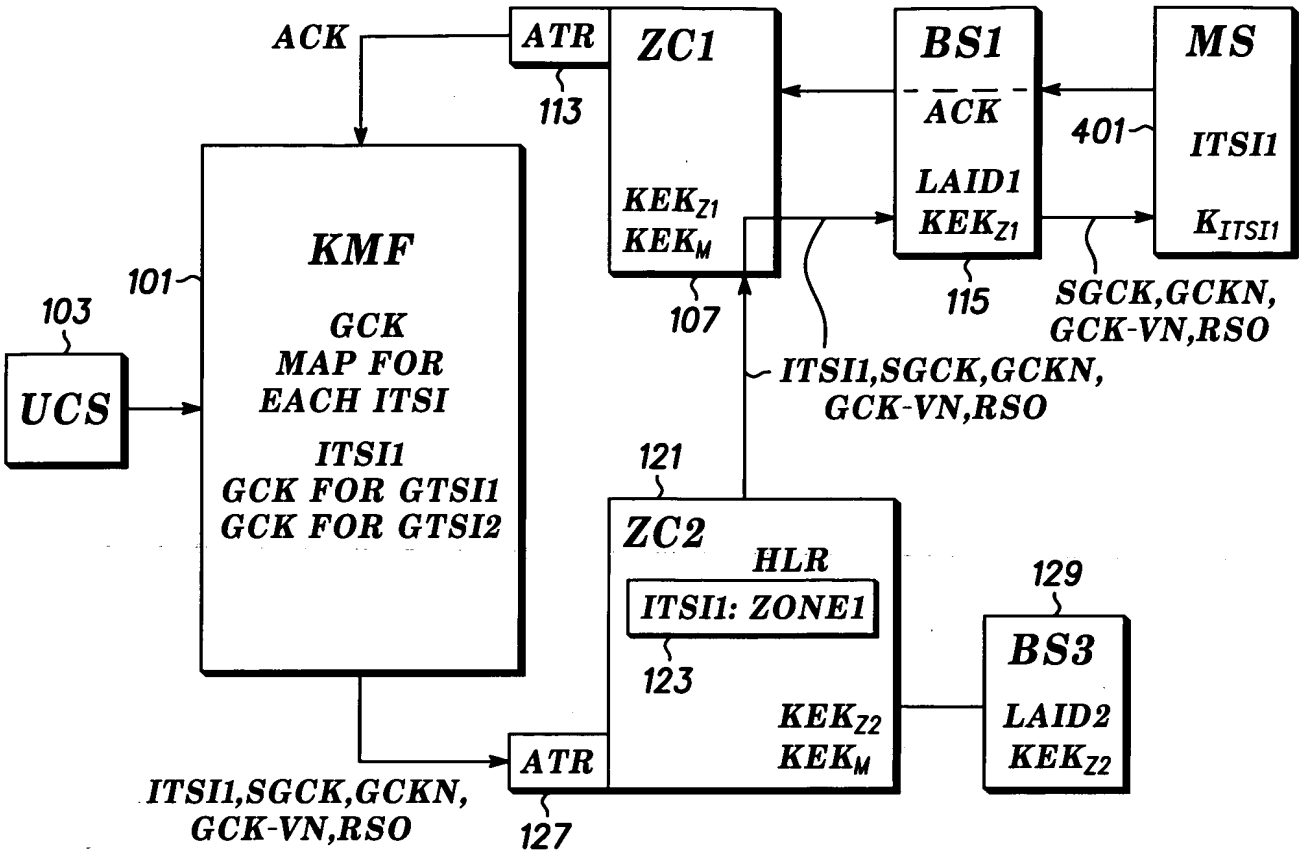
ACK
ATR
113
ZC1
KEK_{Z1}
KEK_M
107
BS1
ACK
LAID1
KEK_{Z1}
115
MS
401
ITSI1
K_{ITSI1}
SGCK,GCKN,
GCK-VN,RSO
ITSI1,SGCK,GCKN,
GCK-VN,RSO
KMF
101
GCK
MAP FOR
EACH ITSI
ITSI1
GCK FOR GTSI1
GCK FOR GTSI2
103
UCS
121
ZC2
HLR
ITSI1: ZONE1
123
KEK_{Z2}
KEK_M
129
BS3
LAID2
KEK_{Z2}
ATR
127
ITSI1,SGCK,GCKN,
GCK-VN,RSO

FIG. 16

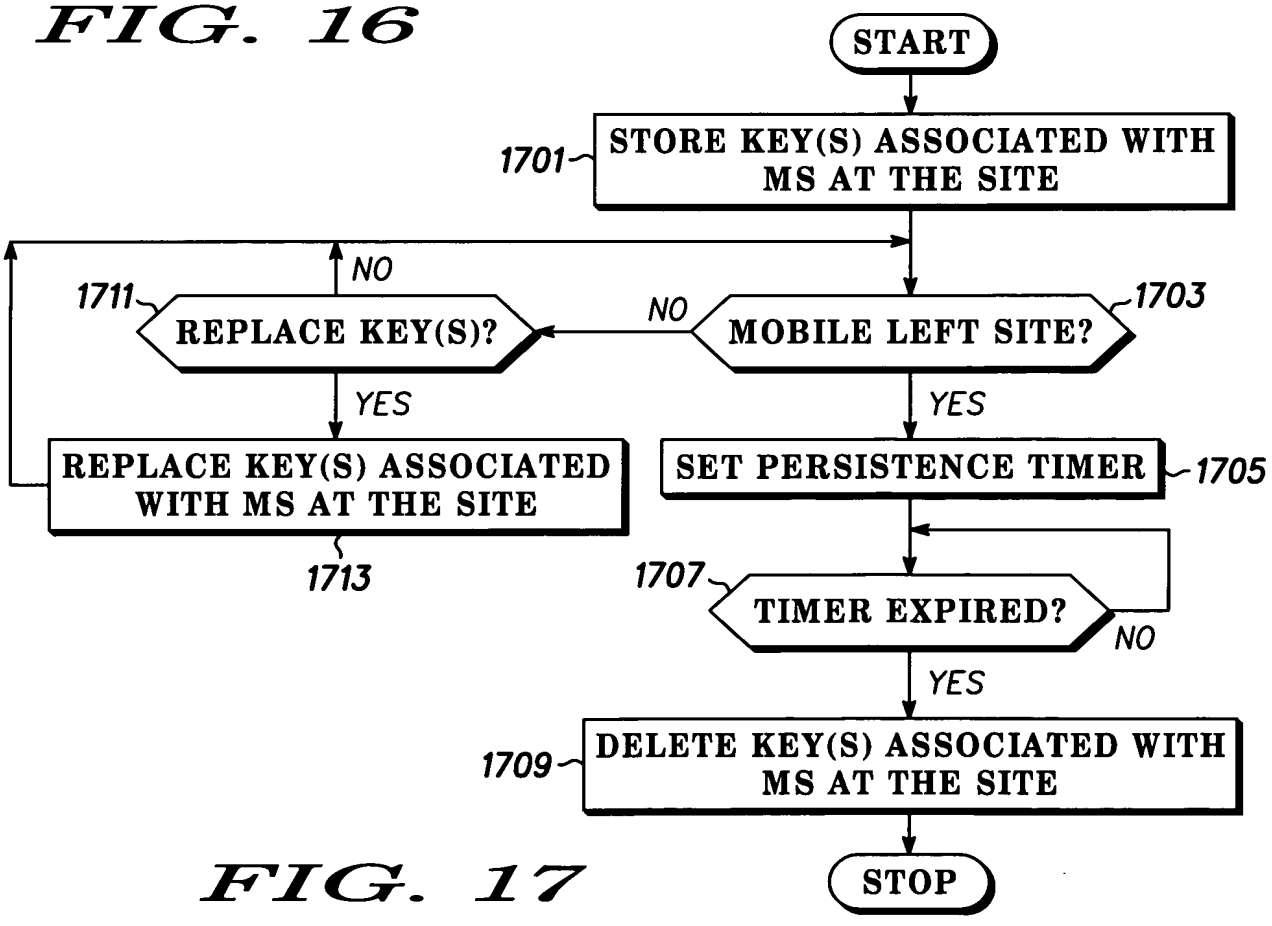
START
1701
STORE KEY(S) ASSOCIATED WITH MS AT THE SITE
NO
1711
REPLACE KEY(S)?
NO
MOBILE LEFT SITE?
1703
YES
YES
REPLACE KEY(S) ASSOCIATED WITH MS AT THE SITE
1713
SET PERSISTENCE TIMER
1705
1707
TIMER EXPIRED?
NO
YES
1709
DELETE KEY(S) ASSOCIATED WITH MS AT THE SITE
STOP

FIG. 17